CLAIMS

1. A pharmaceutical composition comprising:

a polymer of less than 50 kilodaltons having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by an intervening sequence of at least 32 Å,and wherein the intervening sequence is neutral, and

a pharmaceutically acceptable carrier.

2. The composition of claim 1, wherein the polymer has non-repeating units.

3. The composition of claim 1, wherein the polymer has repeating units.

4. The composition of claim 3, wherein the polymer has identical repeating units.

5. The composition of claim 3, wherein the polymer has non-identical repeating units.

6. The composition of claim 1, wherein the polymer is a mixed polymer.

7. The composition of claim 6, wherein the mixed polymer is a peptide-nucleic acid.

8. The composition of claim 1, wherein the polymer has at least 10 repeating charge motifs.

9. The composition of claim 1, wherein the polymer has at least 15 repeating charge motifs.

10. The composition of claim 1, wherein the polymer has at least 20 repeating charge motifs.

11. The composition of claim 1, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 115 Å.

12. The composition of claim 1, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 155 Å.

13. The composition of claim 1, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 200 Å.

14. The composition of claim 1, wherein the polymer is a synthetic polypeptide.

15. The composition of claim 1, wherein the polymer is a non-native polypeptide.

16. The composition of claim 1, wherein the polymer is a polypeptide having at least one modified amino acid.

17. The composition of claim 1, wherein the polymer is a polypeptide having at least ten modified amino acids.

18. The composition of claim 1, wherein the polymer is a polypeptide having a positive to negative charge ratio of 1:1.

19. A pharmaceutical composition comprising:
a polypeptide of less than 50 kilodaltons having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 8 amino acids, and
a pharmaceutically acceptable carrier.

20. The composition of claim 19, wherein the polypeptide has non-repeating units.

21. The composition of claim 19, wherein the polypeptide has repeating units.

22. The composition of claim 19, wherein the polypeptide has at least 10 repeating charge motifs.

23. The composition of claim 19, wherein the polypeptide has at least 15 repeating charge motifs.

24. The composition of claim 19, wherein the polypeptide has at least 20 repeating charge motifs.

25. The composition of claim 19, wherein the positive and negative charges of the repeating charge motifs are separated by at least one neutral amino acid.

26. The composition of claim 19, wherein the positive and negative charges of the repeating charge motifs are separated by at least five neutral amino acids.

27. The composition of claim 19, wherein the positive and negative charges of the repeating charge motifs are on adjacent amino acids and are not separated by any neutral amino acids.

28. The composition of claim 19, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 27 amino acids.

29. The composition of claim 19, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 37 amino acids.

30. The composition of claim 19, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 47 amino acids.

31. The composition of claim 19, wherein the polypeptide is a synthetic polypeptide.

32. The composition of claim 19, wherein the polypeptide is a non-native polypeptide.

33. The composition of claim 19, wherein the polypeptide has at least one modified amino acid.

34. The composition of claim 19, wherein the polypeptide has at least ten modified amino acids.

35. The composition of claim 19, wherein the polypeptide has a positive to negative charge ratio of 1:1.

36. The composition of claim 19, wherein the amino acids separating the charged repeats are neutral amino acids.

37. A method for inducing IL-2 secretion comprising:
contacting an IL-2-secreting cell with an effective amount for inducing IL-2 secretion of a polymer of less than 50 kilodaltons having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 32 Å and wherein the polymer has non-repeating units.

38. The method of claim 37, wherein the polymer has at least 10 repeating charge motifs.

39. The method of claim 37, wherein the polymer has at least 15 repeating charge motifs.

40. The method of claim 37, wherein the polymer has at least 20 repeating charge motifs.

41. The method of claim 37, wherein the positive and negative charges of the repeating charge motifs are separated by at least one neutral unit.

42. The method of claim 37, wherein the positive and negative charges of the repeating charge motifs are separated by at least five neutral units.

43. The method of claim 37, wherein the positive and negative charges of the repeating charge motifs are on adjacent units and are not separated by any neutral units.

44. The method of claim 37, wherein the polymer is a synthetic polymer.

45. The method of claim 37, wherein the polymer is a non-native polymer.

46. The method of claim 37, wherein the polymer is a polypeptide.

47. The method of claim 46, wherein the positively charged free amino moiety results from a naturally occurring positively charged amino acid.

48. The method of claim 47, wherein the positively charged amino acid is selected from the group consisting of lysine (K), arginine (R), asparagine (N), and histidine (H).

49. The method of claim 47, wherein the positively charged amino acid is lysine.

50. The method of claim 46, wherein the negative charge results from a naturally occurring negatively charged amino acid.

51. The method of claim 50, wherein the negatively charged amino acid is selected from the group consisting of aspartic acid (D) and glutamic acid (E).

52. The method of claim 50, wherein the negatively charged amino acid is aspartic acid.

53. The method of claim 46, wherein at least one of the units of the polypeptide is a chemically modified amino acid.

54. The method of claim 46, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 27 amino acids.

55. The method of claim 46, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 37 amino acids.

56. The method of claim 46, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 47 amino acids.

57. The method of claim 46, wherein the polypeptide has at least one modified amino acid.

58. The method of claim 46, wherein the polypeptide has at least ten modified amino acids.

59. The method of claim 46, wherein the polymer has a positive to negative charge ratio of 1:1.

60. The method of claim 46, wherein the amino acids separating the charged repeats are neutral amino acids.

61. A method for inducing IL-2 secretion comprising:
contacting an IL-2-secreting cell with an effective amount for inducing IL-2 secretion of a polypeptide of less than 50 kilodaltons having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 8 amino acids.

62. The method of claim 61, wherein the polypeptide is formed of repeating units and wherein the repeating charge motif is at least part of the repeating unit.

63. A method for treating an IL-2-responsive disorder by inducing IL-2 secretion, comprising:
administering to a subject having an IL-2-responsive disorder an effective amount for inducing IL-2 secretion a polymer of less than 50 kilodaltons having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 32 Å and wherein the subject is not preparing to undergo surgery.

64. The method of claim 63, wherein the IL-2-responsive disorder is a disorder selected from the group consisting of AIDS, renal cell carcinoma, and melanoma.

65. A method for inducing protection against abscess formation associated with infection comprising:
administering to a subject in need of such protection a pharmaceutical preparation containing an effective amount for inducing protection against abscess formation of a compound selected from the group consisting of IL-2 and an IL-2 inducing compound.

66. The method of claim 65, wherein the IL-2 inducing compound is selected from the group consisting of an activated T cell, SEA, an anti-CD3 antibody, an oxidative chemical, and tucaresol.

67. A method for inducing protection against abscess formation associated with infection comprising:
administering to a subject in need of such protection a pharmaceutical preparation containing an effective amount for inducing protection against abscess formation of a polymer of less than 50 kilodaltons having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 32 Å and wherein the polymer has non-repeating units.

68. The method of claim 67, wherein the pharmaceutical preparation induces IL-2.

69. The method of claim 67, wherein the pharmaceutical preparation induces IL-10.

70. The method of claim 67, wherein the pharmaceutical preparation is administered to the subject before the subject has been exposed to abscess forming conditions.

71. The method of claim 67, wherein the pharmaceutical preparation is administered to the subject after the subject has been exposed to abscess forming conditions.

72. The method of claim 67, wherein the pharmaceutical preparation is administered to a subject in need of surgery.

73. The method of claim 67, wherein the pharmaceutical preparation is administered to a subject who has undergone surgery.

74. The method of claim 67, wherein the pharmaceutical preparation is administered to the subject after the subject has been exposed to abscess forming conditions.

75. The method of claim 67, wherein the pharmaceutical preparation is given in conjunction with one or more anti-bacterial agents selected from the group consisting of penicillin G, penicillin V, ampicillin, amoxicillin, bacampicillin, cyclacillin, epicillin, hetacillin, pivampicillin, methicillin, nafcillin, oxacillin, cloxacillin, dicloxacillin, flucloxacillin, carbenicillin, ticarcillin, avlocillin, mezlocillin, piperacillin, amdinocillin, cephalexin, cephradine, cefadoxil, cefaclor, cefazolin, cefuroxime axetil, cefamandole, cefonicid, cefoxitin, cefotaxime, ceftizoxime, cefmenoxine, ceftriaxone, moxalactam, cefotetan, cefoperazone, ceftazidme, imipenem, clavulanate, timentin, sulbactam, neomycin, erythromycin, metronidazole, chloramphenicol, clindamycin, lincomycin, vancomycin, trimethoprim-sulfamethoxazole, aminoglycosides, quinolones, tetracyclines and rifampin.

76. The method of claim 67, wherein the polymer has at least 10 repeating charge motifs.

77. The method of claim 67, wherein the polymer has at least 15 repeating charge motifs.

78. The method of claim 67, wherein the polymer has at least 20 repeating charge motifs.

79. The method of claim 67, wherein the positive and negative charges of the repeating charge motifs are separated by at least one neutral unit.

80. The method of claim 67, wherein the positive and negative charges of the repeating charge motifs are separated by at least five neutral units.

81. The method of claim 67, wherein the positive and negative charges of the repeating charge motifs are on adjacent units and are not separated by any neutral units.

82. The method of claim 67, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 47 amino acids.

83. The method of claim 67, wherein the polymer is a synthetic polymer.

84. The method of claim 67, wherein the polymer is a non-native polymer.

85. The method of claim 67, wherein the polymer is a non-polysaccharide.

86. The method of claim 67, wherein the polymer is a non-polypeptide.

87. The method of claim 67, wherein the polymer is a polypeptide.

88. The method of claim 87, wherein the positively charged free amino moiety results from a naturally occurring positively charged amino acid.

89. The method of claim 88, wherein the positively charged amino acid is selected from the group consisting of lysine (K), arginine (R), asparagine (N), and histidine (H).

90. The method of claim 88, wherein the positively charged amino acid is lysine.

91. The method of claim 87, wherein the negative charge results from a naturally occurring negatively charged amino acid.

92. The method of claim 91, wherein the negatively charged amino acid is selected from the group consisting of aspartic acid (D) and glutamic acid (E).

93. The method of claim 91, wherein the negatively charged amino acid is aspartic acid.

94. The method of claim 87, wherein at least one of the units of the polypeptide is a chemically modified amino acid.

95. The method of claim 87, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 27 amino acids.

96. The method of claim 87, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 37 amino acids.

97. The method of claim 87, wherein the polypeptide has at least one modified amino acid.

98. The method of claim 87, wherein the polypeptide has at least ten modified amino acids.

99. The method of claim 87, wherein the polymer has a positive to negative charge ratio of 1:1.

100. The method of claim 87, wherein the amino acids separating the charged repeats are neutral amino acids.

101. A method for inducing protection against abscess formation associated with infection comprising:

administering to a subject in need of such protection a pharmaceutical preparation containing an effective amount for inducing protection against abscess formation of a polypeptide of less than 50 kilodaltons having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 8 amino acids.

102. The method of claim 101, wherein the polypeptide is formed of repeating units and wherein the repeating charge motif is at least part of the repeating unit.

103. A method of activating T cells comprising:

contacting a T cell in the presence of an antigen presenting cell with an effective amount for inducing IL-2 secretion of a polymer of less than 50 kilodaltons having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 32 Å and wherein the polypeptide has non-repeating units.

104. A method of activating T cells comprising:

contacting a T cell in the presence of an antigen presenting cell with an effective amount for inducing IL-2 secretion of a polypeptide of less than 50 kilodaltons having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 8 amino acids.

105. The method of claim 104, wherein the polypeptide is formed of repeating units and wherein the repeating charge motif is at least part of the repeating unit.

106. A method for treating a T-cell-responsive disorder by activating a T cell to produce Th1-cell-specific cytokines, comprising:
administering to a subject having a T-cell-responsive disorder an effective amount for inducing IL-2 secretion by the T cell of a polymer of less than 50 kilodaltons having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 32 Å and wherein the subject is not preparing to undergo surgery.

107. The method of claim 106, wherein the T-cell-responsive disorder is selected from the group consisting of: insulin-dependent diabetes mellitus, experimental allergic encephalomyelitis, inflammatory bowel disease, and allograft rejection.

108. A method for treating a subject having a disorder characterized by an inappropriate IgG antibody response to specific antigen comprising:
administering to a subject having a disorder characterized by an inappropriate IgG antibody a pharmaceutical preparation containing an effective amount for suppressing IgG antibody response to specific antigen of a polymer of less than 50 kilodaltons having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 32 Å, wherein when the polymer is a polypeptide the polymer does not consist of lysine (K), glutamic acid (E), alanine (A), and tyrosine (Y) residues in a relative molar ratio of 3-7 parts of K to 1-3 parts of E to 4-7 parts of A, to 0.5-2 parts of Y, and wherein the subject is not preparing to undergo surgery.

109. The method of 108, wherein the pharmaceutical preparation is administered to the subject once a day.

110. The method of 108, wherein the pharmaceutical preparation has a positive to negative charge ratio of 1:1.

111. A method for reducing postoperative surgical adhesion formation occurring at a surgical site, comprising:

administering to a subject in need of such protection, at a site other than at the surgical site, a pharmaceutical preparation containing an effective amount for producing protection against postoperative surgical adhesion formation of a zwitterionic polymer having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 32 Å.

112. The method of claim 111, wherein the zwitterionic polymer induces IL-2.

113. The method of claim 111, wherein the zwitterionic polymer induces IL-10.

114. The method of claim 111, wherein the molecular weight of the polymer is about 1.5 kilodaltons to about 50 kilodaltons.

115. The method of claim 114, wherein the polymer comprises a polypeptide.

116. The method of claim 111, wherein the molecular weight of the polymer is greater than about 50 kilodaltons to less than about 500 kilodaltons.

117. The method of claim 116, wherein the polymer comprises a polysaccharide.

118. The method of claim 111, wherein the molecular weight of the polymer is greater than or equal to about 500 kilodaltons to about 5000 kilodaltons.

119. The method of claim 111, wherein the administering begins before the subject undergoes a surgical procedure involving the surgical site.

120. The method of claim 119, wherein the administering begins at least one day before the subject undergoes the surgical procedure involving the surgical site.

121. The method of claim 111, wherein the polymer is not crosslinked.

122. The method of claim 111, wherein the polymer is at least partly crosslinked.

123. The method of claim 111, wherein the administering at a site other than at the surgical site is systemic.

124. The method of claim 111, wherein the administering at a site other than at the surgical site involves a route of administration selected from the group consisting of intravenous and subcutaneous.

125. The method of claim 111, wherein the polymer has non-repeating units.

126. The method of claim 111, wherein the effective amount is about 1-10 mg/kg body weight of the subject.

127. A method for reducing postoperative surgical adhesion formation occurring at a surgical site, comprising:
locally administering to the surgical site of a subject in need of such protection a pharmaceutical preparation containing an effective amount for producing protection against postoperative surgical adhesion formation of a zwitterionic non-polysaccharide polymer having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 32 Å.

128. The method of claim 127, wherein the molecular weight of the non-polysaccharide polymer is about 1.5 kilodaltons to about 50 kilodaltons.

129. The method of claim 127, wherein the molecular weight of the non-polysaccharide polymer is greater than about 50 kilodaltons to less than about 500 kilodaltons.

130. The method of claim 127, wherein the molecular weight of the non-polysaccharide polymer is greater than or equal to about 500 kilodaltons to about 5000 kilodaltons.

131. The method of claim 127, wherein the non-polysaccharide polymer comprises a polypeptide.

132. The method of claim 127, wherein the administering begins before the subject undergoes a surgical procedure involving the surgical site.

133. The method of claim 132, wherein the administering begins at least one day before the subject undergoes the surgical procedure involving the surgical site.

134. The method of claim 127, wherein the non-polysaccharide polymer is not crosslinked.

135. The method of claim 127, wherein the non-polysaccharide polymer is at least partly crosslinked.

136. The method of claim 127, wherein the non-polysaccharide polymer has non-repeating units.

137. The method of claim 127, wherein the effective amount is about 1-10 mg/kg body weight of the subject.

138. A method for reducing postoperative surgical adhesion formation occurring at a surgical site, comprising:
locally administering to the surgical site of a subject in need of such protection a pharmaceutical preparation containing an effective amount for producing protection against postoperative surgical adhesion formation of a zwitterionic polysaccharide polymer having at least two repeating charge motifs, wherein the repeating charge motif is composed of a positively charged free amino moiety and a negative charge, wherein the positively charged free amino moieties of the at least two repeating charge motifs are separated by a distance of at least 32 Å.

139. The method of claim 138, wherein the molecular weight of the polysaccharide polymer is about 1.5 kilodaltons to about 50 kilodaltons.

140. The method of claim 138, wherein the molecular weight of the polysaccharide polymer is greater than about 50 kilodaltons to less than about 500 kilodaltons.

141. The method of claim 138, wherein the administering begins before the subject undergoes a surgical procedure involving the surgical site.

142. The method of claim 141, wherein the administering begins at least one day before the subject undergoes the surgical procedure involving the surgical site.

143. The method of claim 138, wherein the polysaccharide polymer is not crosslinked.

144. The method of claim 138, wherein the polysaccharide polymer is at least partly crosslinked.

145. The method of claim 138, wherein the polysaccharide polymer has non-repeating units.

146. The method of claim 138, wherein the effective amount is about 1-10 mg/kg body weight of the subject.